SIRIUS XM
RADIO INC.

1500 Eckington Place, N.E.
Washington, D.C. 20002
Tel: 202-380-4000
Fax: 202-380-4500
www.sirius.com www.xmradio.com

February 16, 2010

WRITTEN EX PARTE

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

Re: Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band - WT Docket No. 07-293; Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band - IB Docket No. 95-91, GEN Docket No. 90-357, RM-8610

Dear Ms. Dortch:

In recent meetings with FCC staff, Sirius XM Radio Inc. ("Sirius XM") explained that the potential for WCS mobile devices to cause harmful interference to satellite radio reception is highly dependent on the types of mobile devices that are deployed and the transmitting activity levels of those devices.[1] If WCS mobile subscriber devices transmit for a high percentage of time, this would increase the probability that those devices will interfere with satellite radio reception when in close proximity to a Sirius XM radio receiver. In contrast, WCS proponents argue that WCS subscriber devices would transmit for only brief periods of time, thus minimizing the probability of interference when the devices are in close proximity to a satellite radio receiver.

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[1] *See e.g.*, Letter from Terrence R. Smith and James S. Blitz, Sirius XM Radio Inc. to Mr. Ronald Repasi, Deputy Chief, Office of Engineering and Technology, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 95-91, submitted January 4, 2010 ("Sirius XM January 4th Ex Parte").

Until now, little empirical data has been submitted into the record on the usage profiles of advanced mobile devices that operate on WiMAX platforms, which is the preferred technology platform of WCS licensees who have been active in this proceeding.[2] To address this deficiency, Sirius provides the following data showing the operating characteristics of an existing WiMAX market deployment it obtained from WiMAX devices currently available for sale and use on Clearwire's "4G" network in Philadelphia, Pennsylvania.

The information Sirius XM gathered starkly contrasts with the optimistic operating scenarios that WCS interests have advanced in this rulemaking and their claims that there is a low potential for mobile WCS systems to interfere with satellite radio operations.[3] This data is critical to the Commission's understanding of the interference environment relevant to satellite radio, as it provides demonstrative evidence of WiMAX deployments that the WCS licensees have failed to share. The data show persistent and extensive transmissions from WiMAX devices that far exceed the transmissions the WCS licensees have claimed will occur in a WiMAX network.[4] Further, this data also confirms the validity of the test files Sirius XM has used as profiles for WiMAX devices in bench and field tests. The results reported herein clearly demonstrate the correlation between the test profiles used in previous Sirius XM filings and commercially available WiMAX equipment and deployments.

Background: The record in this proceeding provides little visibility into the nature of mobile transmissions in a real-world WiMAX deployment. The Ashburn tests conducted last summer purported to provide an example of one such deployment, but the WCS licensees' demonstration at Ashburn provided little information as to the nature of how operators might deploy this technology and operate the myriad flexible controls that are needed for the service.[5] In fact, the WCS licensees' Ashburn setup was so opaque that even they could not accurately inform the Commission of the uplink duty cycle deployed during their demonstration.[6] As Sirius XM has

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2 *See e.g.*, Letter from William Wallace, DigitalBridge Communications, Mark Ellison, NRTC, Jennifer McCarthy, NextWave Wireless Inc., Raj Singh, Horizon Wi-Com to Blair Levin, Executive Director, Onmibus Broadband Initiative, Federal Communications Commission, WT Docket No. 07-293, submitted December 11, 2009.

3 *See e.g.*, Letter from Paul J. Sinderbrand, Counsel to the WCS Coalition to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, submitted November 11, 2009, at attachment, p. 15.

4 *See e.g.*, Letter from Jennifer M. McCarthy, NextWave Wireless Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, submitted November 16, 2008.

5 *See* Letter from Terrence R. Smith and James S. Blitz, Sirius XM Radio Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 95-91, submitted August 3, 2009 at 2 ("Sirius XM August 3rd Ex Parte").

6 Letter from Paul J. Sinderbrand, Counsel to the WCS Coalition to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, submitted January 29, 2010, at 4.

shown, there is substantial risk to satellite radio service in changing the existing WCS rules to permit mobile broadband service in this band without appropriate safeguards.[7]

Test Market: Clearwire and Comcast offer mobile broadband service in the Philadelphia market using WiMAX technology over Clearwire's network on frequencies are allocated to the Broadband Radio Service ("BRS") and Educational Broadband Service ("EBS") near 2.5 GHz.[8] Over the past several weeks, Sirius XM has subscribed to this service to better understand the nature of WiMAX uplink transmissions in order to provide the Commission with more complete information about how WCS mobile devices might impact customers of adjacent band satellite radio service. Given the reasonably close proximity of the 2.5 GHz frequencies to the WCS/SDARS band, and Comcast's status as a licensee in the WCS band, the Philadelphia deployment is an excellent proxy for a test market.[9]

Findings: In general, our observations of the Philadelphia deployment show that WiMAX based mobile devices transmit far more repetitively than the WCS licensees have claimed. Additionally, we found that for each of the applications tested, the uplink transmissions were more intensive as a percentage of time than the WCS licensees previously represented.[10] Finally, we observed that transmit power levels for subscriber devices typically operate at much higher levels than suggested by WCS Coalition members.[11] If these findings are representative of WiMAX-based devices that can be expected in the WCS band, the potential for interference to satellite radio reception would be substantial.

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7 *See e.g.*, Sirius XM January 4th Ex Parte at 2.

8 *See* Comcast Launches High-Speed Wireless Data Service in Philadelphia, November 4, 2009, available at http://www.comcast.com/About/PressRelease/PressReleaseDetail.ashx?prid=935 (visited Feb. 12, 2010). See also, Clearwire Expands Sales Distribution for CLEAR(TM) 4G Mobile Internet Service in Philadelphia, November 5, 2009, available at http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1351731&highlight= (visited Feb. 12, 2010).

9 A full description of the test set-up is attached herein as an appendix.

10 Over the course of the past few years, it has become apparent that there is some confusion in the use of the terms "duty cycle" and "activity level" between Sirius XM and some of the WCS licensees. Here, Sirius XM uses the term "duty cycle" to identify the portion of a WiMAX transmission frame that the base station has allocated for uplink traffic and "activity level" to indicate the percentage of transmission frames that the user device transmits uplink information to the base station. In this pleading, Sirius XM provides actual measurements and data so there should be no misunderstanding.

11 Due to weather related delays, this data is still being compiled and will be submitted in the near future.

The Philadelphia WiMAX network operates in the frequency range between 2.625 GHz and 2.672 GHz as a TDD system with 10 MHz channels and a 5 ms frame structure. The frame appears to be apportioned to allow 40% of the frame for uplink transmissions and the remaining 60% for downlink. The figures and graphs that follow provide details of the uplink transmission activity for various applications.

Our examination of the WiMAX subscriber device showed that the device constantly transmits short bursts in nearly every frame. This activity of regular communication with the network comprises the transmission of 3 symbols in each 5 msec WiMAX frame resulting in an uplink activity level of 6% in each WiMAX frame for every WiMAX device even in the absence of any user generated uplink application traffic. This level of activity contradicts assertions of WCS Coalition members that WiMAX mobile devices transmit only when needing to uplink information.[12]

Figure 1 - Baseline Uplink Transmission with No Application Traffic

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12 *See e.g.*, Letter from Jennifer M. McCarthy, NextWave Wireless Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, submitted November 16, 2008 at Attachment, p. 3 ("***WCS user terminals do not transmit that often***. Even for extraordinary amount of uplink data, a given WCS user terminal will on average transmit for <u>just 2 minutes out of every hour</u> (i.e., with an activity factor of 0.029). The vast majority of the time, a WCS user terminal will pose no threat whatsoever to an SDARS receiver because it is not transmitting.") (*emphasis in original*).

Figure 1 shows the progression of packets that include uplink transmissions in the absence of any user application traffic as well as a zoomed-in view of two successive packet transmissions. It should be noted that the activity shown in Figure 1 is nearly identical to the test files Sirius XM used in testing a proposed 6% duty cycle limit.[13]

When a user application is initiated, bursts of data follow the "pilot" transmissions as noted in Figure 1. To understand the nature of uplink transmission activity in the Philadelphia WiMAX network, several different user applications were initiated.

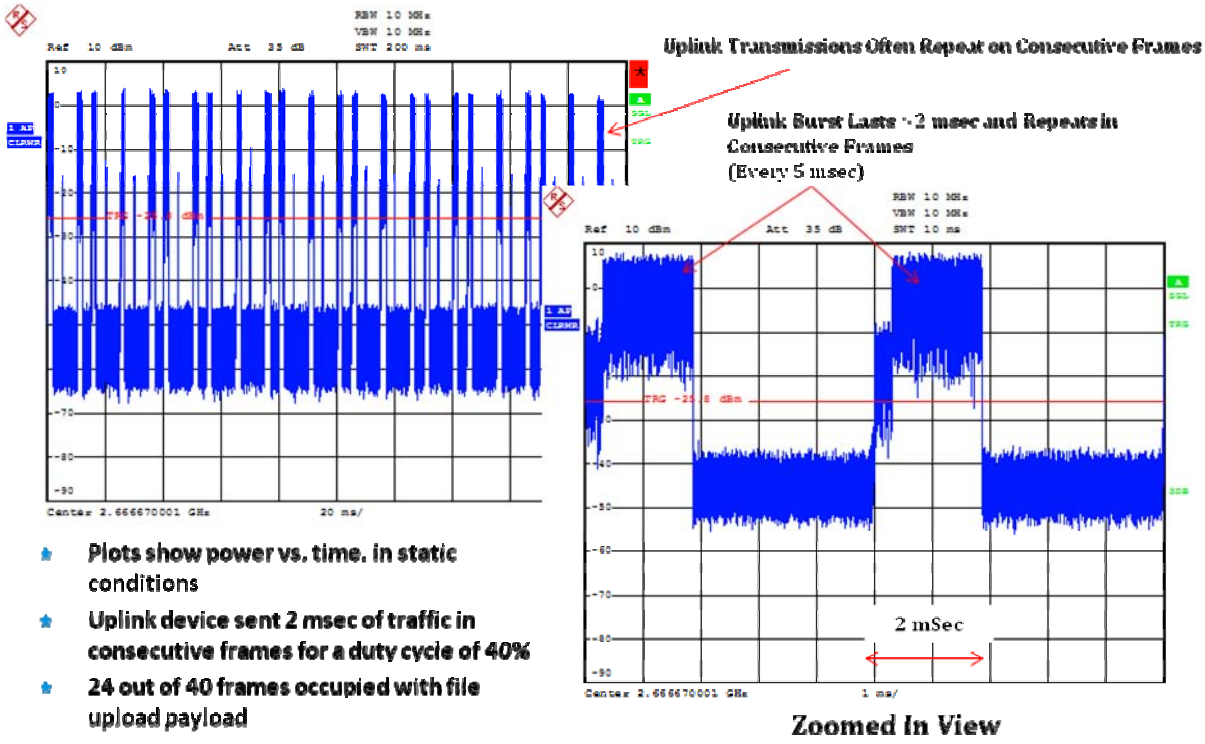

Figure 2 - Uplink Transmissions with Single User File Upload Application

In Figure 2, a simple file upload was initiated to transfer a high resolution photo (typical of a smartphone) from the WiMAX device under test to a fixed server. The user application data occupied the full 2 msec uplink capacity of the 5 msec frame and utilized the majority of transmission frames to satisfy the application. In this common application, we see 40% duty cycle burst from a single user device 60% of the time until the file has been completely uploaded.

13 Sirius XM January 4th Ex Parte at 4, 5.

Similar to the demonstrations in Ashburn, the scenario in Figure 2 demonstrates the activity of only a single user device. Given the economics of building out cellular networks, it is likely that multiple users would be operating in proximity – particularly during peak traffic hours when users of both satellite radio and wireless services would be traveling the same congested roads.

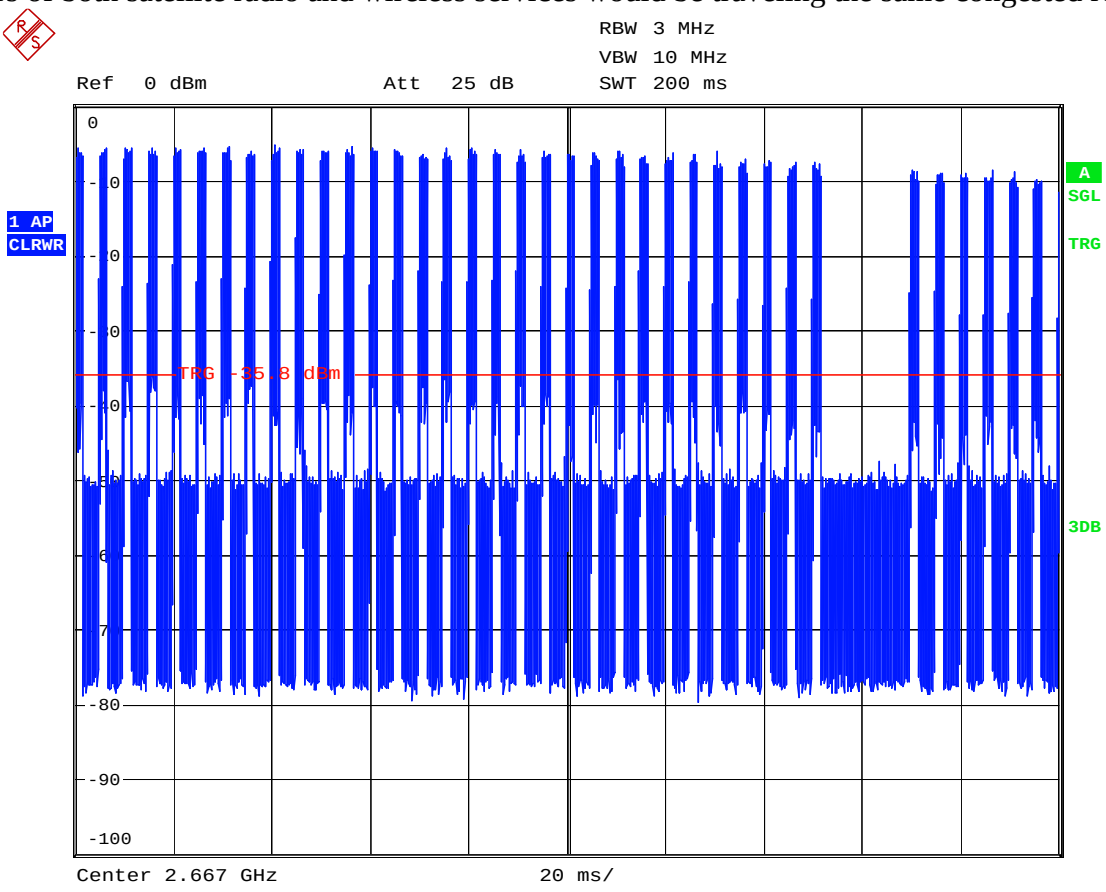

Figure 3 - Simultaneous File Upload from two mobile devices

Figure 3 shows the transmit power from two users in proximity of one another, each simultaneously uploading a picture file consistent with the upload in Figure 2. In this instance, the network accommodates both users by utilizing nearly all the available frames for uplink traffic. Again, the full 2 msec available for uplink in the packet is utilized and 37 of the 40 packets shown (~93%) contain uplink transmission bursts from just two simultaneous users.

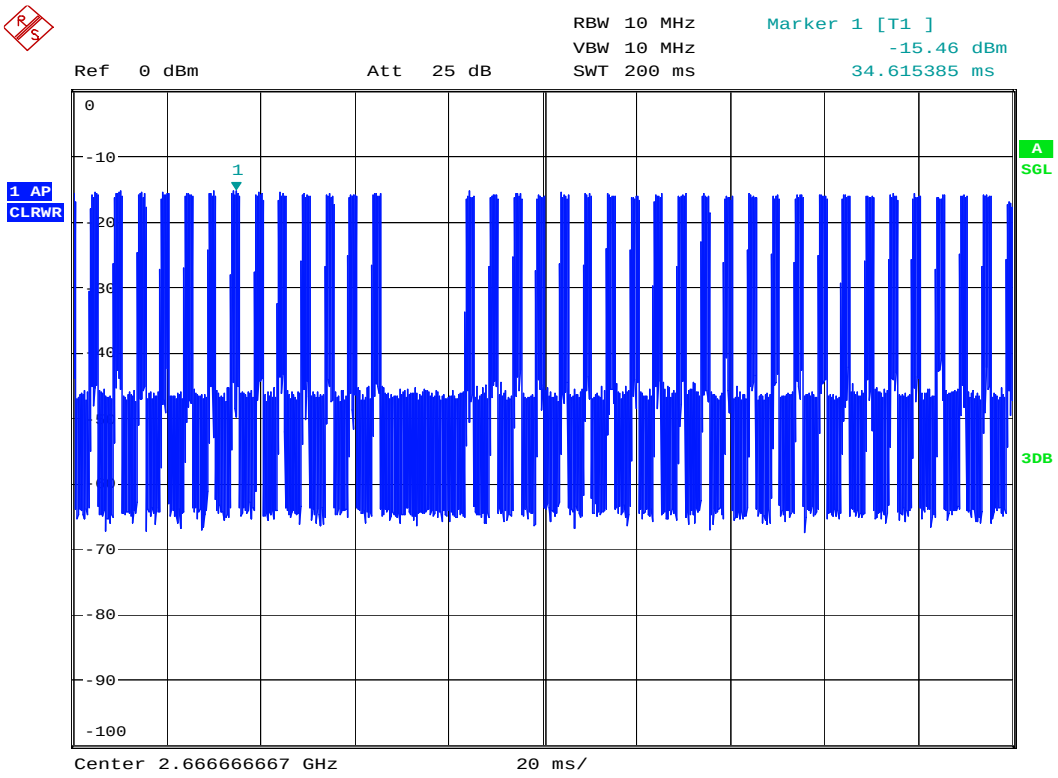

Figure 4 - Mobile Video Upload Application

Figure 4 shows a plot of mobile transmit power vs. time when uplinking a video stream from a web camera. Similar to the file upload application, the mobile WiMAX device fills the available uplink allotment in nearly every packet. Since a video upload application would be the equivalent of a stream of picture file uploads, the persistence of this transmission activity would be extensive. During the Ashburn testing, the WCS Coalition did not demonstrate a video upload application. Given the anticipated demand for bandwidth intensive wireless applications such as video, the Commission should carefully evaluate the effects of such transmissions on satellite radio reception.

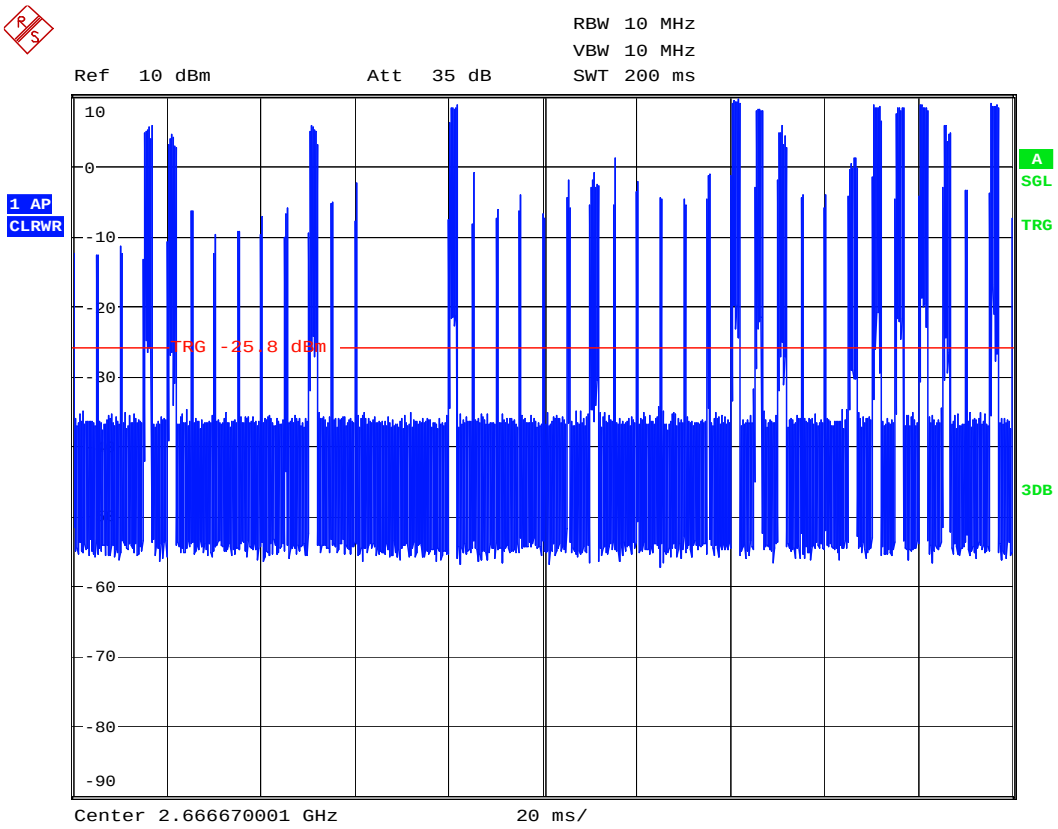

Figure 5 - Uplink Transmissions for Voice Call Application

Finally, Sirius XM observed the transmission burst usage of a voice call application using VOIP. As seen in Figure 5, the voice call is less bandwidth intensive than the file and video upload examples. Nonetheless, this use case still represents a substantial density of transmission time and power. As shown above, the VOIP application utilizes the 40% duty cycle available in given packets and occupies 35% of the transmission packets (14 out of 40).

WCS licensees, particularly NextWave and Horizon, have questioned the validity of the test files Sirius XM has used as profiles for bench and field tests showing the interference potential between mobile WCS devices and satellite radio reception.[14] The observations from the Clearwire WiMAX deployment in Philadelphia clearly demonstrate the correlation between the test profiles Sirius XM used in its previous filings and commercially available WiMAX equipment and deployments. Figure 6 below illustrates the close correlation between the Sirius XM-generated WiMAX waveforms and the Clearwire's over-the-air waveforms. The two traces at the top of Figure 6 show, left to right, the 6% and 43% duty cycle WiMAX waveforms Sirius XM has generated and used for testing throughout this proceeding. Directly below these traces

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[14] *See e.g.*, Letter from Paul J. Sinderbrand, Counsel to the WCS Coalition to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, submitted March 9, 2009, at 2.

are the over-the-air trace captures of the Clearwire transmitted signals for, left to right, uplink chatter and file upload. This direct comparison demonstrates that, contrary to the assertions of WCS interests, the burst properties of Sirius XM's test waveforms closely align with the burst properties of Clearwire's operational WiMAX network.

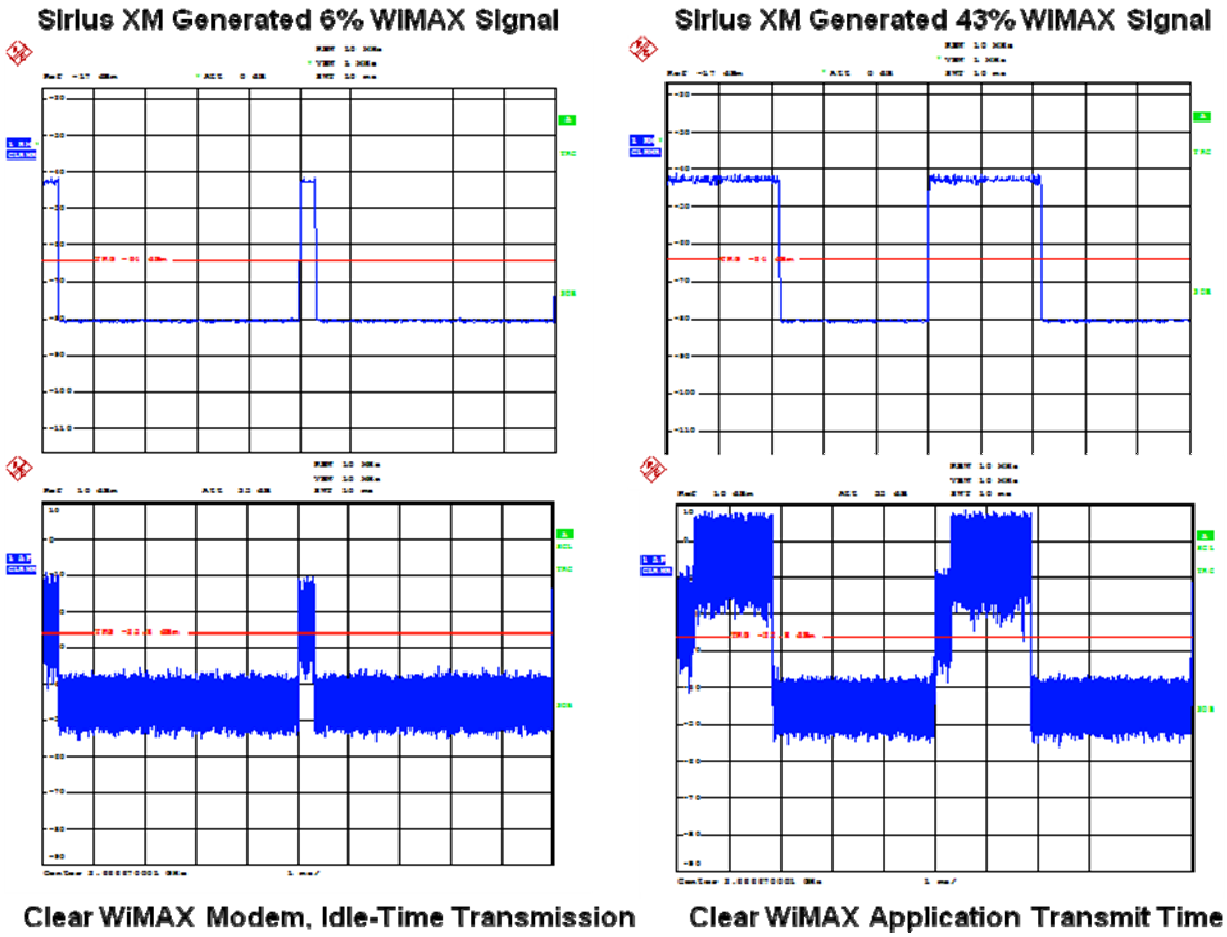


Figure 6 - Comparison of Test Profiles with Clear service in Philadelphia

***Conclusion*:** WCS interests have attempted to paint a picture that WCS mobile devices have little potential to cause interference because they would transmit only rarely and only at low operating powers. Our analysis of devices now available for public use on Clearwire's 4G network in Philadelphia proves that characterization is wrong. If mobile broadband networks are successful in attracting customers, then this data affirms Sirius XM's view that mobile and portable subscriber devices will pose a very real threat of interference to more than 35 million satellite radio listeners.

Respectfully submitted,

/s/ *Terrence R. Smith*
Terrence R. Smith
Corporate Vice President and Chief Engineering Officer
Sirius XM Radio Inc.
1221 Avenue of the Americas
New York, NY 10020

/s/ *James S. Blitz*
James S. Blitz
Vice President, Regulatory Counsel
Sirius XM Radio Inc.
1500 Eckington Place, N.E.
Washington D.C. 20002

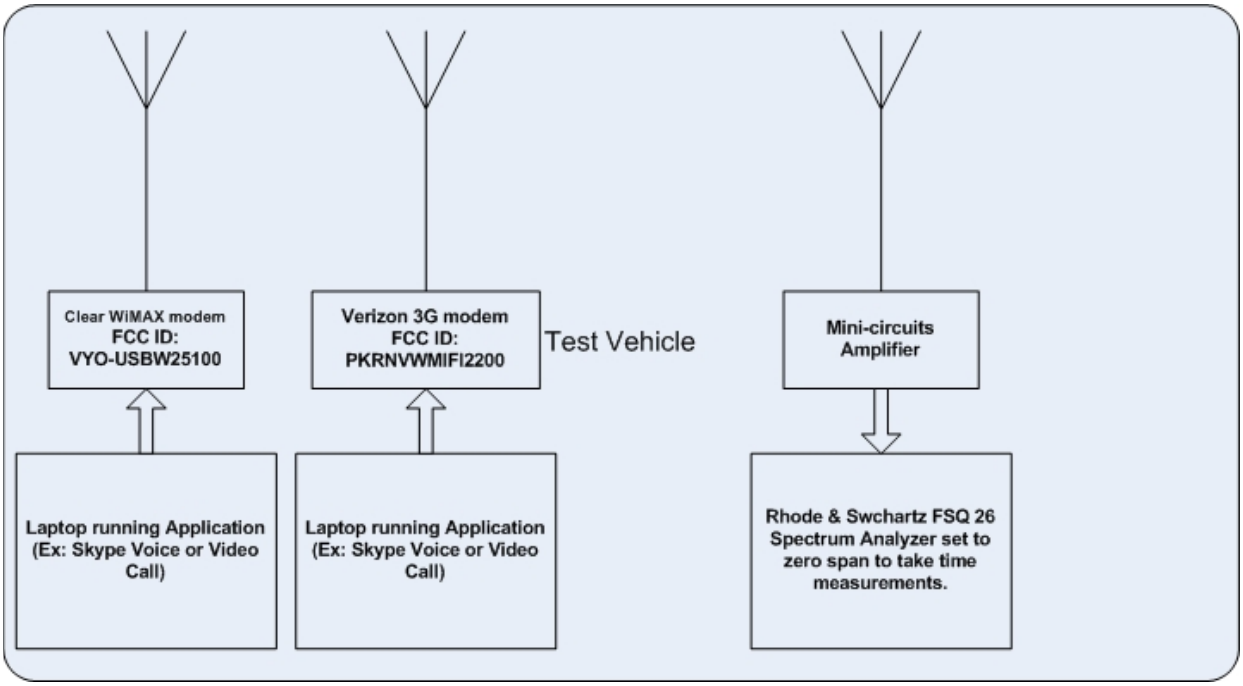
Appendix: Test Set-Up

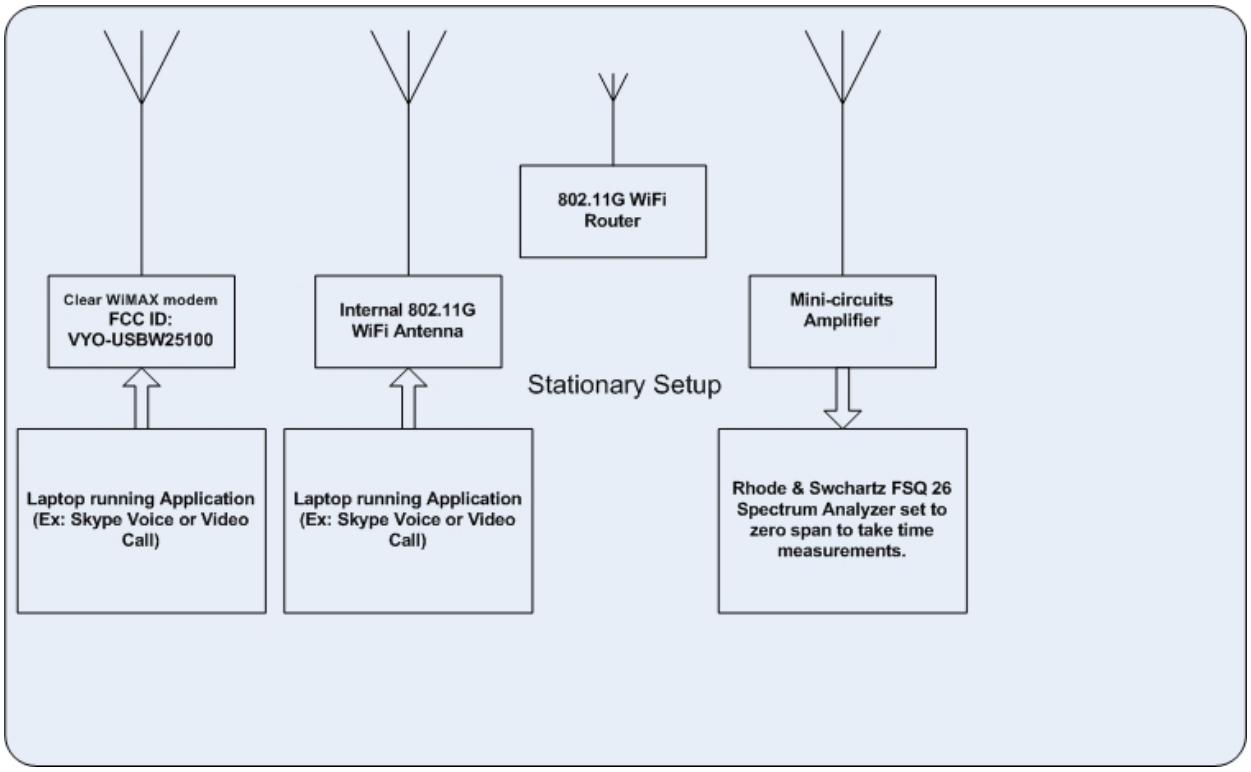
CC:
Julius Knapp
Mindel De La Torre
Ruth Milkman
Robert Nelson
Roger Noel
Pat Forster
Tom Derenge
Moslem Sawez
Jay Jackson
Chip Fleming

Appendix: Test Set Up

This appendix describes the test setup Sirius XM used to observe and measure the WiMAX signals transmitted from the Clearwire mobile device. Figures A-1 and A-2 show the mobile and stationary versions of the test setup, respectively. The WiMAX modem for both the mobile and stationary tests was a Motorola 21500 USB modem which was plugged into a laptop computer. This modem wirelessly connected to the Clearwire WiMAX network and was used to generate uplink traffic. The transmitted signals were monitored with a co-located Rhode and Schwarz FSQ-26 spectrum analyzer with an attached antenna and preamplifier. The detected WiMAX signals were displayed on the spectrum analyzer using a zero-span setting and 10 MHz resolution bandwidth, using various sweep times. In this fashion, it is possible to visualize the burst properties of the WiMAX signal in time as the spectrum analyzer updates the screen to show time varying plots of the received power in the 10MHz around the center frequency. In Figure A-1, a Verizon 3G modem was used with a laptop to act as a connection endpoint for the WiMAX traffic. In the stationary mode shown in Figure A-2, an 802.11g network was used as the connection endpoint instead of the 3G network. Other than this difference, the test setups were the same. For both the mobile and stationary scenarios, the voice and video connections were handled with Skype running on both computers, and the file upload was initiated over a standard email service.

The mobile test setup was driven in a van at various points within the greater Philadelphia Clearwire coverage area.




802.11G WiFi Router
Clear WiMAX modem FCC ID: VYO-USBW25100
Internal 802.11G WiFi Antenna
Mini-circuits Amplifier
Stationary Setup
Laptop running Application (Ex: Skype Voice or Video Call)
Laptop running Application (Ex: Skype Voice or Video Call)
Rhode & Swchartz FSQ 26 Spectrum Analyzer set to zero span to take time measurements.